J. B. Root.

Steam Boiler.

No. 98,802. Patented Jan. 11, 1870.

Fig. 4.

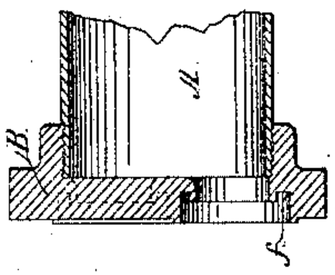


Fig. 3.

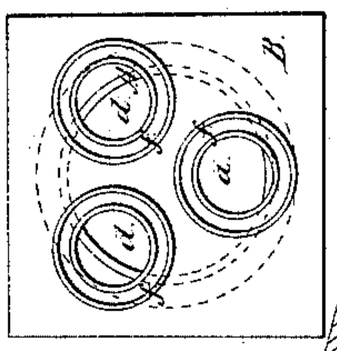


Fig. 5.

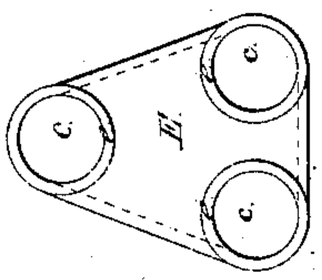


Fig. 2.

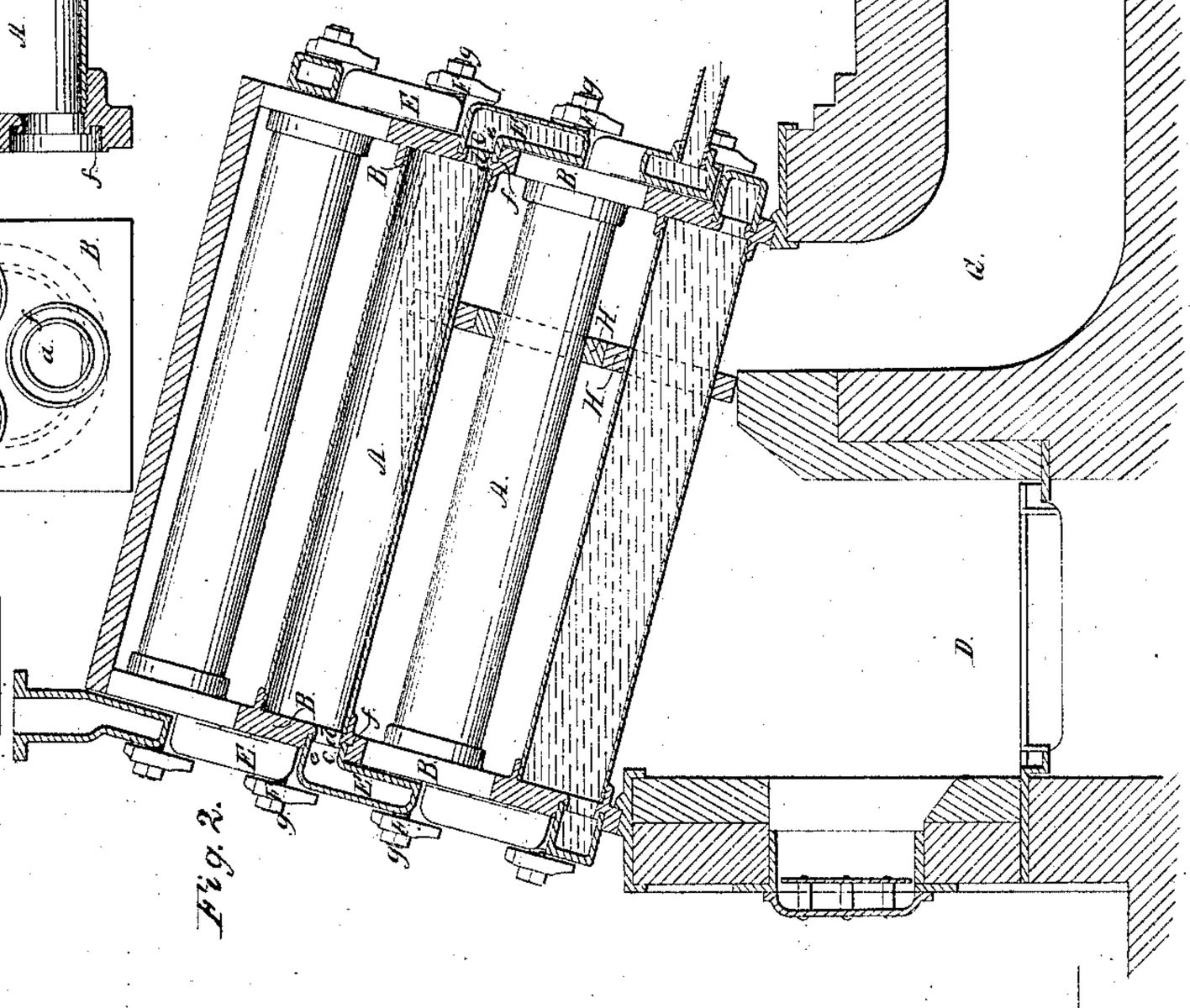


Fig. 6.

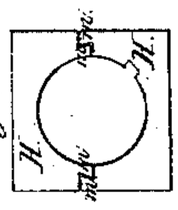
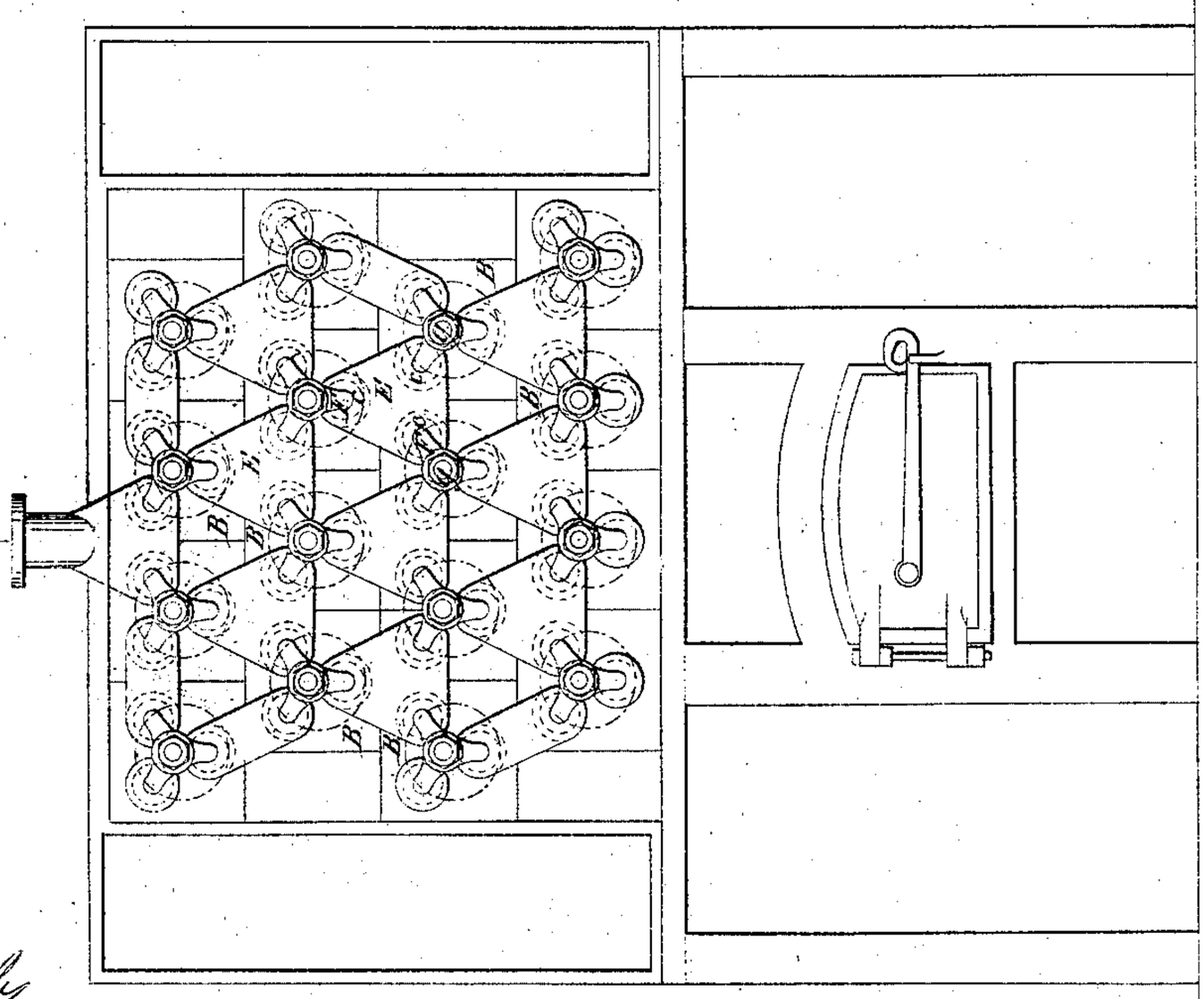


Fig. 7.



Witnesses.
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J. Haynes

Inventor
John B. Root

United States Patent Office.

JOHN B. ROOT, OF NEW YORK, N. Y.

Letters Patent No. 98,802, *dated January* 11, 1870; *antedated November* 24, 1869.

IMPROVEMENT IN STEAM-GENERATORS.

The Schedule referred to in these Letters Patent and making part of the same.

To all whom it may concern:

Be it known that I, JOHN B. ROOT, of the city, county, and State of New York, have invented a new and useful Improvement in Steam-Boilers, of which the following is a full, clear, and exact description, reference being had to the accompanying drawing, forming part of this specification, and in which—

Figure 1 represents a front-end view of a steam-boiler constructed in accordance with my improvement;

Figure 2, a vertical longitudinal section thereof;

Figure 3, a face or end view, on a larger scale, of one of the heads of which the end or ends of the boiler are composed, detached;

Figure 4, a transverse section through said head;

Figure 5, an inner face view of one of the hollow end caps used to establish the circulation; and

Figure 6, a face view of one of the bridge-wall plates, detached.

Similar letters of reference indicate corresponding parts.

This improvement has reference to steam-boilers, of the description shown in Letters Patent of the United States, issued to me on the 4th day of February, A. D. 1868, and which is made up of a series of tubes arranged to lie in direction of their length, preferably at a slight inclination, over the fire-place, and connected at their ends with head-plates of parallelogrammic contour, to form close ends to the boiler, said tubes, which constitute the steam and water-spaces, being connected at their opposite ends, outside the heads, with each other, in a similar and double or varied manner, to promote circulation through them.

My invention, in this relation, consists, first, in a certain construction of hollow caps and outside connections, with their tubes arranged so that their parallelogrammic heads break joint, and the fire has its course diverted, in passing through between them, so that each tube, at its opposite ends, is not only connected with the tube or tubes lying immediately above and below it, but also with the tube or tubes lying in the same horizontal plane, or to the side of the same, thereby establishing a free circulation horizontally as well as vertically, and whereby cross-tubes or drums, to secure horizontal circulation, are dispensed with.

To effect this result, the invention comprises hollow caps, each of which is formed with triangularly-arranged openings, surrounded by annular lips made to fit correspondingly-shaped sockets in each of the three adjacent tube-heads, a series of such hollow caps being thus arranged outside of the heads or head-plates, and being secured to the latter by bolts and clamps, each of which latter is constructed to bear or bind on three of said caps.

Furthermore, the invention includes a certain construction of fire-bridge wall, which consists in making it of independent plates, arranged to encircle in a separate manner each tube, and formed in sections, to facilitate removal of a tube without detaching it from its head.

Referring to the accompanying drawing—

A A represent the tubes, which form the water-spaces or steam and water-spaces of the boiler. These tubes, of which there may be any suitable number, are arranged to lie in a zigzag or intermediate manner, as represented by red lines in fig. 1, and are preferably set to occupy slightly-inclined positions to the horizon.

This diagonal arrangement of the tubes secures a tortuous and most effective action of the flame and heated gases on the outsides of the tubes; also causes the heads or parallelogrammic blocks B B, into which said tubes at their ends are screwed, or with which they are otherwise connected, to break joint, as represented in fig. 1.

D is the fire-place of or to the boiler, and G, the smoke-escape flue.

To secure the desired circulation and action, connection is established between the tubes at their ends, so that either one of the intermediate tubes is in direct communication with adjacent tubes lying above, below, and to either or both sides of it, thus establishing a free circulation and return action, both up and down and horizontally, or in every direction, as it were, at both or opposite ends of the boiler, and rendering unnecessary upper and lower cross-pipes or drums at the ends of the boiler, to secure horizontal circulation.

This is shown as effected by means of hollow caps, E E, fitted to lie against the heads B B, and formed with diagonally-arranged openings, *c c c*, on their inner faces.

Each head B has three similarly-arranged openings, *d d d*, through it, in communication with the tube A, to which said head is fitted, and the hollow caps E E are so arranged over the faces of the heads or ends of the boiler, as that the several apertures *c c c* in each of said caps communicate respectively with one of the apertures *d* in the head of an upper tube, and a similar aperture, *d*, in the heads of each of two lower and adjacent side tubes, thus establishing a free horizontal as well as vertical circulation and return action at both or opposite ends of the boiler.

These hollow caps E E may be fitted in or to the heads by annular lips, *e e e*, arranged to surround the apertures *c c c*, and made to fit annular sockets, *f f f*, surrounding the openings *d d d* in the heads, India-rubber rings or other soft and elastic packing being inserted in the sockets, if desired, to make close the joints.

To secure or hold the hollow caps E E to their

places, triangular clamps, F F, are used, fastened by nuts and stud-bolts *g g*, connected with the heads B B, each of said clamps being so arranged as that it binds or holds on three of the caps at their adjacent corners.

The bridge-wall in rear of the fire-place, and which may be disposed as represented, or otherwise, or there may be more than one, but which, as here arranged, serves to secure, first, a front upward and afterward a back downward draught in establishing connection with the escape-flue G, is made up of a series of separate plates, H H, of parallelogrammic form, so that, combined, they form a wall, and each of which is made to encircle or receive through it a tube, A. This construction of the bridge-wall forms a ready mode of fitting and taking apart, or of taking out and putting in a single tube without disturbing the rest, and in order that the same may be done without removal of the heads or blocks B B from it, each plate H is made in sections, fitted together by dovetail joints, *m m*, or otherwise secured in a readily-detachable manner, which admits of them being taken from off the tube, and so allows of the passage of the latter, with head-plates or blocks on it, through the boiler.

Such provision will be found of great advantage, both as regards replacement and changing the relative positions of the tubes, that is, an upper for a lower one, &c.; also in renewing sections of the bridge-wall, and, if desired, of varying the position of the latter by a different disposition of the plates H H along the tubes.

What is here claimed, and desired to be secured by Letters Patent, is—

1. The combination, with the tubes A A, arranged substantially as described, and heads or end blocks B B, having triangularly-arranged openings, *d d d*, in them, of the hollow caps E E, provided with similarly-arranged openings, *c c c*, disposed to connect with the apertures *d* in the heads of adjacent tubes, essentially as shown and described.

2. The fire-bridge, constructed of independent plates H H, arranged to encircle the tubes A A, and of parallelogrammic form on their outside edges, to constitute, when combined, a cross or dividing-wall, essentially as described.

JOHN B. ROOT.

Witnesses:

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